

### **REMARKS**

The Office Action dated September 17, 2009, has been received and carefully reviewed. The preceding amendments and the following remarks form a full and complete response thereto.

Claims 1, 7-17 and 41 are pending in the present application and are submitted for consideration. Claim 1 is the sole independent claim. Support for new claim 41 can be found, for example, in the substitute specification at paragraph 100. No new matter has been added

#### **Objection to the Specification**

The Office objected to the Specification because for containing an embedded hyperlink and/or other form of browser-executable code. In particular, the Examiner objects to “www.vidf.org” in paragraph 0023 and “www.vesa.org” in paragraph 0031. Applicants respectfully submit that the text “www.vidf.org” in paragraph 0023 and “www.vesa.org” in paragraph 0031 are not embedded hyperlinks and/or other form of browser-executable code. Rather, the allegedly offending text is merely a domain name (*i.e.*, the name of a server connected to the Internet).

#### **Objection to the Information Disclosure Statement**

The Office objected to the information disclosure statement filed March 18, 2009 because “item 139 [has] either not been supplied, or does not list the names of the papers that it represents.” Office Action at 2. The documents of item 139 were supplied but labeled together as “Various presentations given at HOTI’06.” To overcome the Office’s objection, another information disclosure statement is being filed that correctly lists the previously submitted documents, and the previously submitted documents are being resubmitted therewith.

#### **Rejection of Claims over Terrell, Andjelic and Blumrich**

Claims 1, 7-9, 14-17 and 39-40 were rejected under 35 U.S.C. § 103(a) as being obvious over the combination of U.S. Pat. App. Pub. No. 2002/0124108 to Terrell et al. (“Terrell”) in view of U.S. Pat. No. 7,451,456 to Andjelic (“Andjelic”) and further in view of U.S. Pat. No. 7,555,566 to Blumrich et al. (“Blumrich”). Applicants respectfully traverse this rejection and

submit that the claims recite subject matter that is not disclosed or suggested by Terrell, Andjelic or Blumrich.

Independent Claim 1

Claim 1 has been amended to include features recited in claim 17. Accordingly, applicants shall address here the Office's rejection of claim 17.

The Office appears to contend that Terrell discloses a "communication interface being arranged to ... analyze data received over the link and identified as being directed to the operating system or the data port to determine whether that data meets one or more predefined criteria, and if it does meet the criteria transmit an interrupt to the operating system, the predefined criteria being set such that, when the processing of the application is suspended, the communication interface transmits an interrupt to the operating system on receiving data identified as being directed to [a particular logical] data port [associated with the application]," as is required by claim 1.

In support of its rejection of claim 17, the Office cites to Terrell at paragraphs 31, 60, 61 and 62. *See Office Action at page 6.* Applicants have reviewed these portions of Terrell and respectfully submit that Terrell does not disclose (or suggest) setting predefined defined criteria such that, when the processing of the application is suspended, the communication interface transmits an interrupt to the operating system on receiving data identified as being directed to the data port associated with the application.

Applicant admits that Terrell discloses "generat[ing] an interrupt that passes control to the operating system." *See paragraph 31.* But, the similarities between the claimed invention and Terrell end there. Claim 1 does not merely require transmitting an interrupt to the operating system. Rather, claim 1 requires a communication interface that, "when the processing of the application is suspended, ... transmits an interrupt to the operating system on receiving data identified as being directed to [the] data port [associated with the user application]".

This feature is simply not taught in Terrell. Rather, Terrell discloses transmitting an interrupt "[i]f an application program demands conversion of a virtual address to a physical address and the physical address is not associated with appropriate access privileges associated with the requesting application program's process ID," or in response to attempted execution of one of a protected set of instructions if a flag is not set. *Terrell at ¶ 0031, lines 18-24.*

Terrell is silent as to how to handle data received for a suspended application. Therefore, Terrell does not disclose a communication interface that, “when the processing of the application is suspended, ... transmits an interrupt to the operating system on receiving data identified as being directed to [the] data port [associated with the user application],” as required by claim 1. For this reason alone, the rejection of claim 1 should be withdrawn.

An advantage of the above feature combined with the other features of claim 1 is that, when the application is running, the applicant itself can process the out-of-band data because the out-of-band data queue is memory mapped into the address space of the application. And, when an application is suspended, the operating system can process the out-of-band data because the out-of-band data queue is located in the address space of the operating system and the communication interface is arranged, by means of appropriate setting of the predefined criteria, to transmit an interrupt to the operating system on receiving data directed to the suspended application. In order to maintain a connection on behalf of a suspended application the operating system need only access the out-of-band data. The application data itself is generally only of interest to the target application and can simply be queued for the application until it is reinstated and can process the received data.

With respect to Andjelic, Applicants respectfully submit that Andjelic also does not disclose such a feature. Andjelic discloses a network interface that operates in a “user-space tunneled access mode.” Andjelic at col. 5, lines 10-42. In the user-space tunneled access mode, a user application 40 receives data directly into a user level from a network interface controller (NIC), and a kernel receives data into a kernel level indirectly from the NIC through the user level. *Id.* If the user application 40 crashes or fails, the network interface switches from the user-space tunneled access mode to a “default mode” in which the kernel directly receives data into the kernel level from the NIC. Andjelic at col. 5, lines 35-52; col. 7, lines 54-56; col. 8, lines 39-41. But, the claimed queue structure does not read on such a queue structure because the application data queue of Andjelic is then located in the kernel address space and there is still no separate queue for the out-of-band data directed to that application. And, Andjelic does not disclose that, when the user application 40 crashes or fails, the network interface transmits an interrupt to the kernel on received data identified as being directed to the data port associated with the user application 40.

Blumrich does not disclose this feature either. Blumrich is relied upon merely for its disclosure of out-of-band data in col. 24, lines 11-15. Office Action at p. 4. At the cited portion, Blumrich discloses that “[i]nterrupts are carried in the same data stream and may be interleaved into the data at any time, including during a packet transmission, through the use of a special ‘interrupt’ out-of-band bit.” Blumrich at col. 24, lines 11-15. Blumrich does not disclose the suspension of an application or a communication interface that transmits an interrupt to the operating system on receiving data identified as being directed to the data port associated with the user application.

As none of Terrell, Andjelic and Blumrich, alone or in combination, disclose or suggest a communication interface that, “when the processing of the application is suspended, ... transmits an interrupt to the operating system on receiving data identified as being directed to [the] data port [associated with the user application],” the rejection of amended claim 1 is improper. Reconsideration and withdrawal are respectfully requested.

In addition, the combination of Terrell, Andjelic and Blumrich does not disclose or suggest a communication interface arranged to:

- apply to a first queue located in the address space of a user application data received over the link and identified as being directed to a particular logical data port associated with that application; [and]
- apply to a second queue located in the address space of the operating system out-of-band data received over the link for the particular logical data port and identified as being directed to the operating system, the second queue being memory mapped into the address space of the user application,

as required by claim 1.

The Office admits that these features are not disclosed by Terrell. Office Action at pp. 3-4. Instead, the Office relies on Andjelic and Blumrich for these features. *Id.* at pp. 4-5. Specifically, the Office contends that Andjelic discloses applying to a first queue

Andjelic relates to a network device driver architecture whose functionality is distributed between kernel space and user space. The architecture allows an application to directly access a network interface device by means of a user space device driver functionality while also allowing a kernel space device driver to maintain its access to the network interface device by means of “tunnelling” via the same user space device driver functionality. The architecture can also adopt a “default” configuration in which the kernel space device driver accesses the network interface

device directly, as is conventional. The architecture described in Andjelic provides integrated access to a network interface device for both kernel-level and user-level software entities without requiring the network interface hardware to be modified to support user level connections.

It is clear from the architecture of Andjelic that the network interface device cannot access queues at the kernel and in user space, as is required by claim 1. By design, the device driver architecture presents a single interface (or port) to the network interface device. In the default mode, access to the network interface device is by means of the kernel space device driver. In the user-space tunneled access mode, access to the network interface device is by means of the user space device driver functionality. Andjelic at col. 3, line 11-col. 4, line 9; col. 6, line 9-col. 8, line 49; and Figs. 2-4. Since the modes are mutually exclusive, only one mode can be in operation at any one time.

In the default mode, the user-space tunneled mode is off, and only the kernel can access the NIC. *See* Andjelic at col. 8, line 65-col. 9, line 9 and Figs. 5 and 6. In this case, the NRX receive queue is located at the kernel and handled by the kernel space device driver. In the user-space tunneled access mode, both the kernel and user-level applications can access the NIC by means of the user space device driver functionality. *See* col. 9, line 58-col. 10, line 7 and Figs. 9 and 10. The RX queue is preferably supported in kernel space and memory mapped into user space. *See* Andjelic at col. 6, lines 44-49. The user space device driver functionality puts descriptors associated with received messages which are not expected at a user application on a queue for the kernel, KRX. In this manner, the operating system can receive messages by means of a user level connection to the NIC. In neither mode is there a dedicated queue provided for out-of band data associated with a particular data port.

As a result, Andjelic does not disclose: (a) a communication interface in a configuration that can access both kernel and user level queues; (b) providing a user space queue for data for an application and an associated kernel space queue for out-of-band data associated with that application; and (c) a communication interface that can route data in dependence on whether the data is in-band data or out-of-band data. Therefore, Andjelic does not disclose or suggest a communication interface arranged to:

apply to a first queue located in the address space of a user application  
data received over the link and identified as being directed to a particular logical  
data port associated with that application; [and]

apply to a second queue located in the address space of the operating system out-of-band data received over the link for the particular logical data port and identified as being directed to the operating system, the second queue being memory mapped into the address space of the user application,

as required by claim 1.

As noted above, Blumrich is relied upon merely for its disclosure of out-of-band data in col. 24, lines 11-15. Office Action at p. 4. At the cited portion, Blumrich discloses that “[i]nterrupts are carried in the same data stream and may be interleaved into the data at any time, including during a packet transmission, through the use of a special ‘interrupt’ out-of-band bit.” Blumrich at col. 24, lines 11-15. Therefore, Blumrich does not disclose these features either.

The rejection of claim 1 is improper because, even if a person of ordinary skill in the art were to combine Terrell with Andjelic and Blumrich, the person would not arrive at the communication interface recited in claim 1. Reconsideration and withdrawal are respectfully requested.


Further, the rejection is improper because Blumrich is not analogous art. To rely on a reference under 35 U.S.C. § 103, it must be analogous art. MPEP 2141.01(a)(I). According to the MPEP, “a reference in a field different from that of applicant’s endeavor may be reasonably pertinent if it is one which, because of the matter with which it deals, logically would have commended itself to an inventor’s attention in considering his or her invention as a whole.” *Id.*

The passage of Blumrich relied upon by the Office describes an out-of-band bit that acts as an interrupt between compute nodes of a massively parallel supercomputer. Blumrich’s disclosure out-of-band data in this unrelated field would not teach one skilled in the art anything to do with how to structure queues of out-of-band network data. Thus, Blumrich is not reasonably pertinent because the disclosure of an out-of-band bit acting as an interrupt between compute nodes of a massively parallel supercomputer would not have commended itself to an inventor’s attention in considering the queues of out-of-band network data invention as a whole. Accordingly, the rejection of claim 1 over Terrell, Andjelic and Blumrich is improper for this additional, independent reason. Reconsideration and withdrawal of the rejection are respectfully requested.

**CONCLUSION**

All of the stated grounds of rejection have been properly traversed. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding rejections, and that they be withdrawn.

Applicants believe that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

<b>RESPECTFULLY SUBMITTED,</b>					
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